State/Cty CRUISE ACCURACY GUIDES

It is the intent of this chapter to encourage a reasonable balance between cruising cost and sale value consistent with common sense and good judgment. Minimum effort is encouraged on small/low value sales and higher cruise accuracy is our objective on larger/more valuable sales. The goal is for the final sale volume to be within 20% of cruise estimates.

Volume estimates for the purpose of establishing timber sales may be obtained in one of several ways. It may be by cruise using approved procedures, measurement of all or a sample of trees counted or marked, a count of products such as Christmas trees, or measurement of cut products.

The following standards will be used in establishing timber sales:

Lump Sum Sales:

Sales up to $10,000 appraised value = ± 20% with 2 standard deviations.

Sales $10,001 plus appraised value = ± 15% with 2 standard deviations.

Documentation for cruise accuracy must appear in the file and be stated on Form 2460-1. (Actual formulas and examples can be found on page 23-2.)

Scaled Sales and Lock Box Ticket System Sales:

Required minimum number of plots:

If area in acres is:	Number of sample points:
Less than 10	10
11-40	1 per acre
41-80	20 + .5 x _____ acres
81-200	40+ .25 x _____ acres
*Over 200	Found by sample size formula: $N = \frac{4c^2}{e^2}$

*Refer to page 23-2 for actual formulas and examples

Forest Products Permits:

100% tally
or
10% cruise (by area)

The number of plots needed will be based on the total of all species present on the sale area.

EXAMPLE:

STEP 1: Calculate the standard deviation using pre-sale cruise or recon data in the following formula:

$$SD = \sqrt{\sum x^2 / n-1}$$

Where SD = standard deviation
x = deviation from the mean
n = number of samples

Assuming an original sample of 7 plots with the following volume data, the calculation is as follows:

Plot Number	Plot Volume	Amount > Mean (x)	Amount < Mean (x)	x^2
1	33.0	33-17.5 = 15.5		240.25
2	9.0		17.5-9.0 = 8.5	72.25
3	15.5		2.0	4.00
4	24.0	6.5		42.25
5	16.5		1.0	1.00
6	11.5		6.0	36.00
7	13.0		4.5	20.25
Total	122.5			416.00
Mean	17.5			

SD = $\sqrt{416/(7-1)}$ = $\sqrt{69.3}$ = 8.3

STEP 2: Calculate the coefficient of variation using the following formula:

C = 100(SD)/M.

Where C = coefficient of variation in percent
SD = standard deviation
M = mean or average

Using the example above, the calculation is: C = 100(8.3)/17.5 = 830/17.5 = 47.4

STEP 3: Calculate the number of plots required to be within needed percent of error with 2 standard deviations using the following formula: $n = 4(C^2)/e^2$.

Where n = number of samples
C= coefficient of variation
e= error (%)

Using the example above, and a 20 % error, the calculation is: $n = 4\ (47.4^2)/20^2 = 4\ (2246.76)/400 = 8987.04/400 = 22.46$.

This result shows that a minimum of 23 plots must be taken in order for the volume estimate to be within 20% error with 2 standard deviations.